CUBE Scan

BioCon-500™
Bladder Volume Measurement System

SERVICE TRAINING

Mcube Technology Co., Ltd.

www.mcubetech.co.kr

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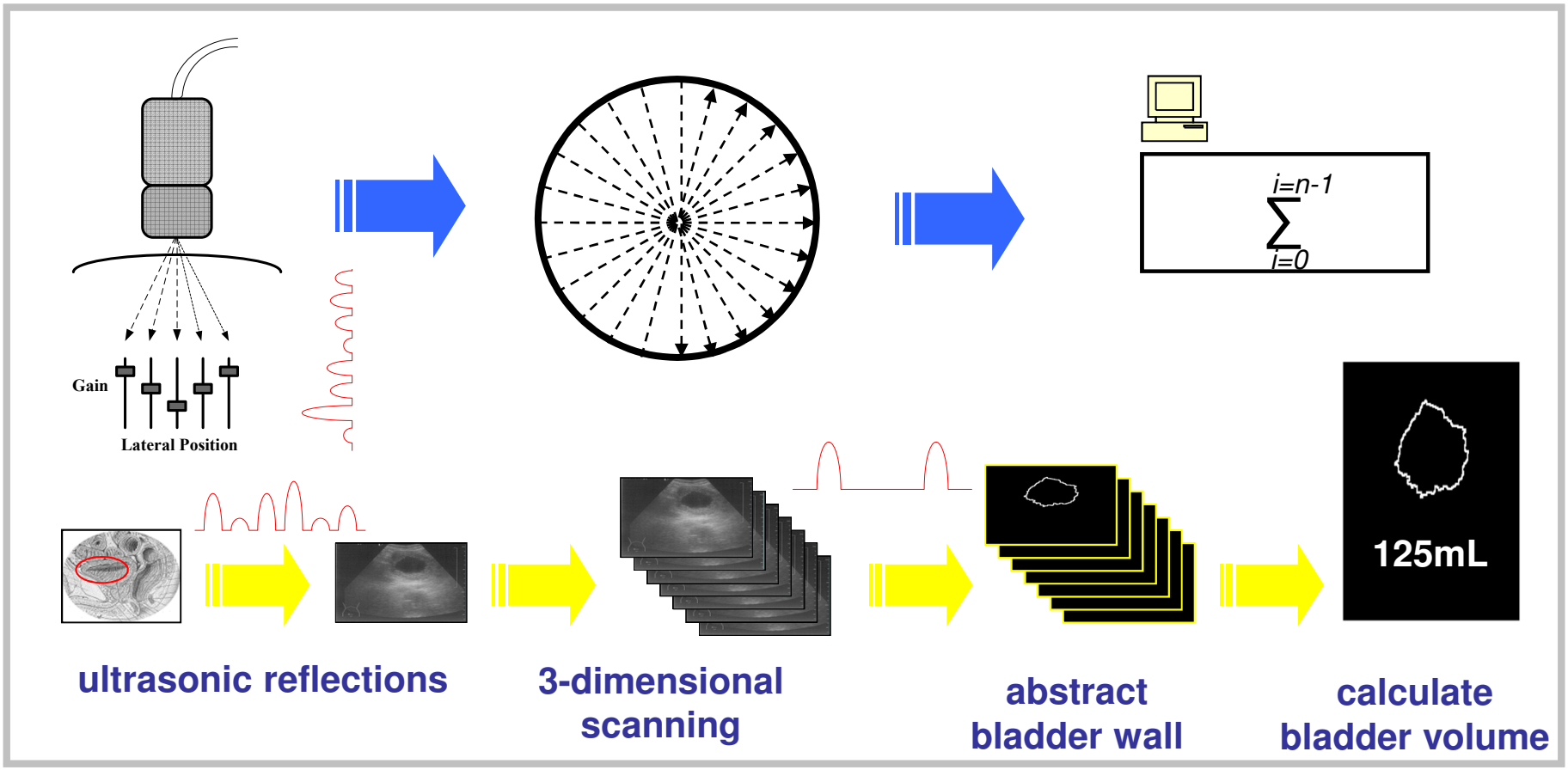
1. General System
2. System Configuration
3. System Setup
4. Module Test
5. Troubleshooting

1. General

PRINCIPLES (1)



1. General

PRINCIPLES (2)

▣ **Measuring ultrasonic reflections within a patient's body**
- differentiates the urinary bladder from the surrounding tissues.

▣ **Measuring ultrasonic reflections on multiple planes**
- 3-dimensional scanning

▣ **Calculates the patient's bladder volume with multiple planes**
- 3-dimensional images
- more accurate than conventional 2-dimensional ultrasound

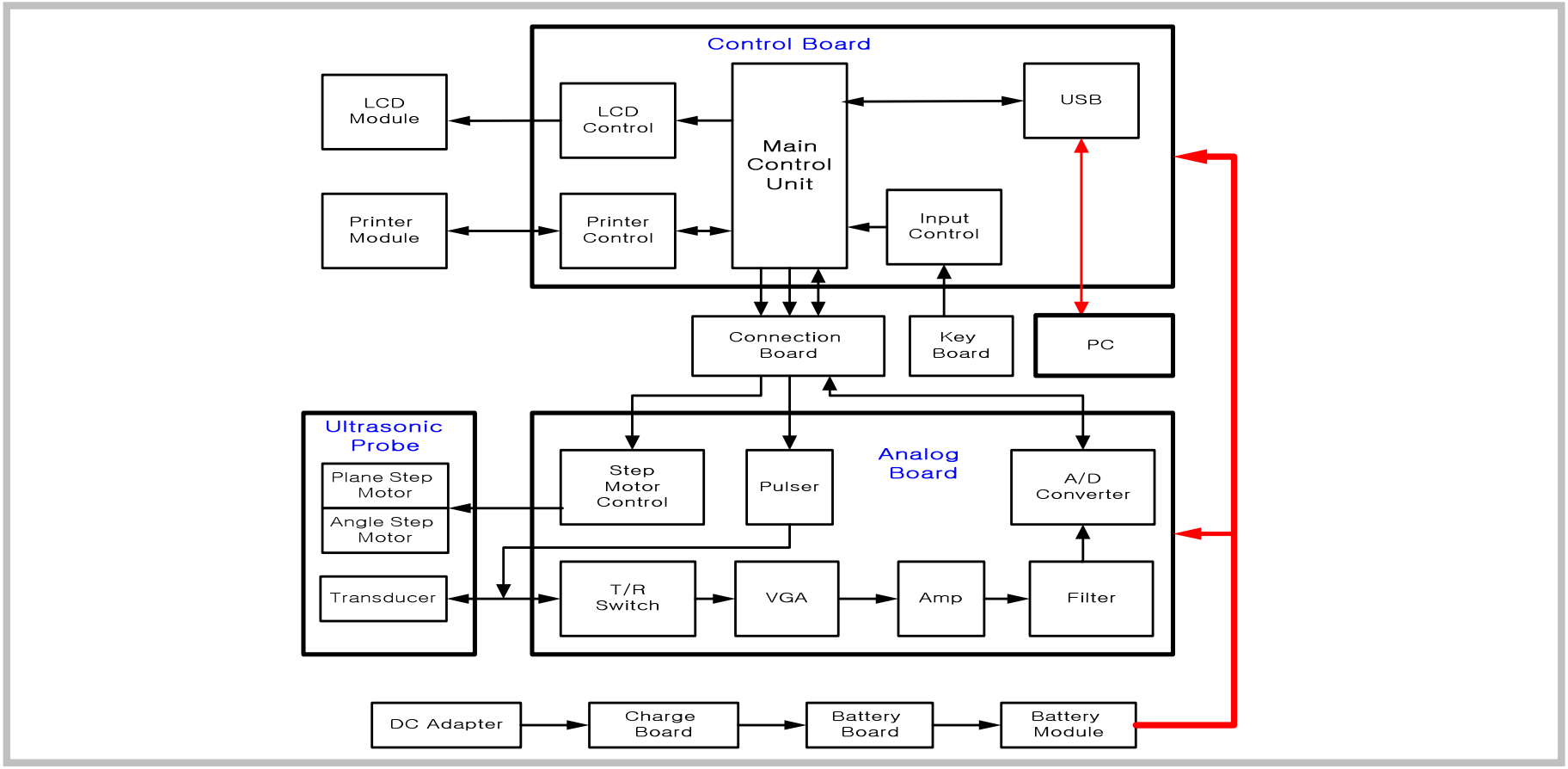
▣ **Displays bladder volume and bladder image**
- you can confirm that the result is reliable with 3D bladder images.

2. System Configuration

- System block diagram
- Connection diagram
- Device disassembly

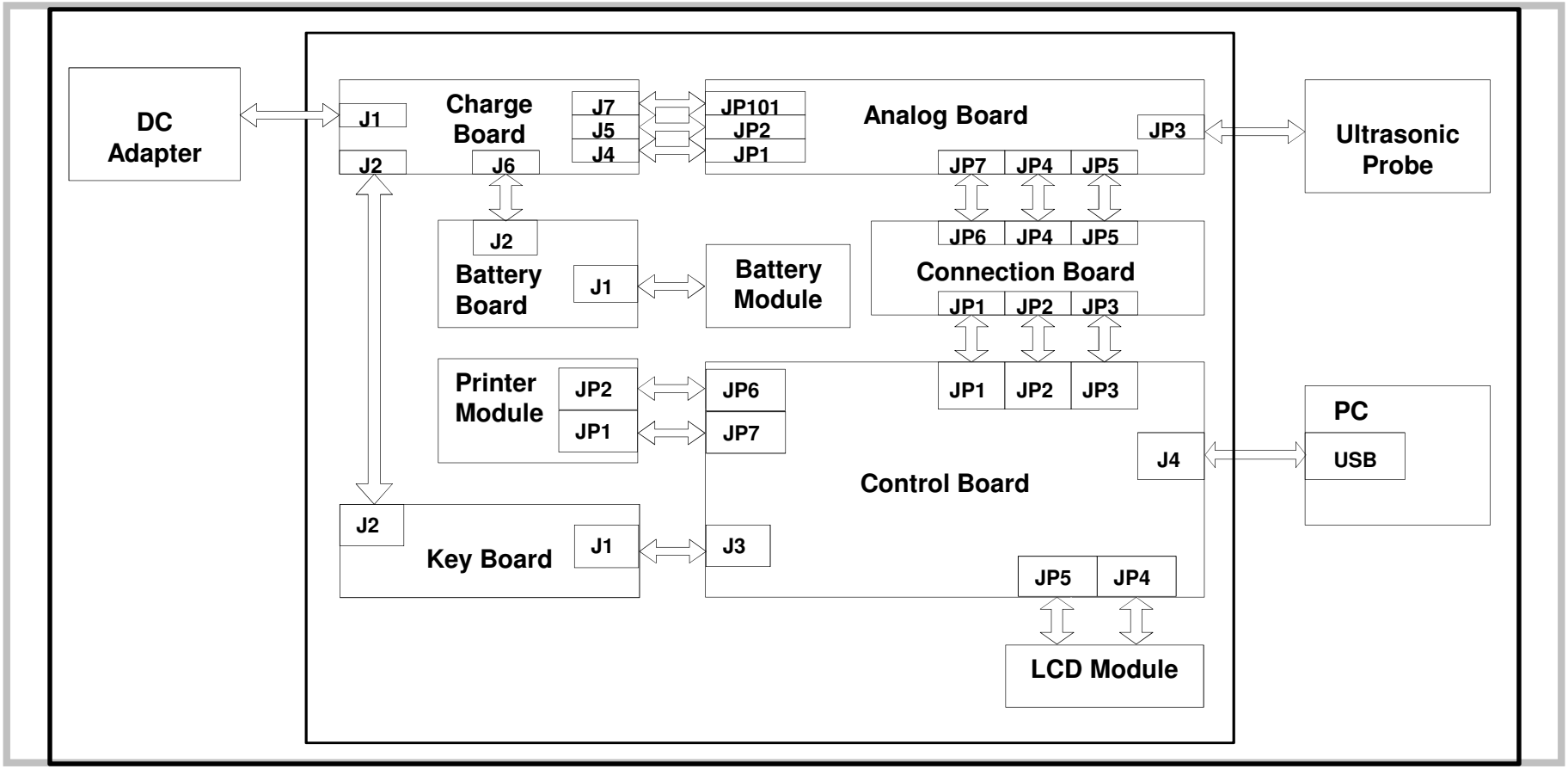
2. System Configuration

System block diagram



2. System Configuration

Connection diagram



2. System Configuration

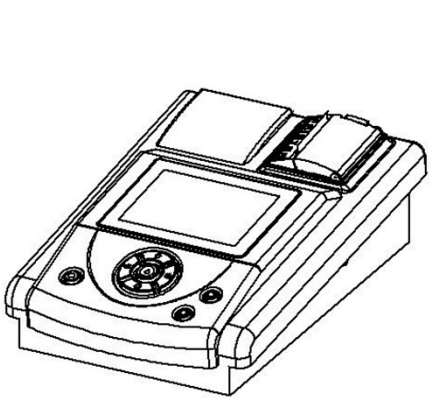
Components of the Device

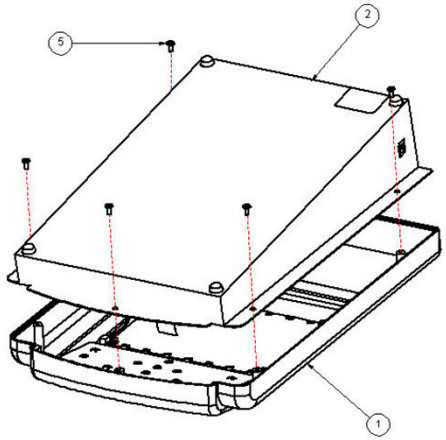
Main Body	Upper Case	LCD Module / Printer Module / Key Board
	Lower Case	Control Board / Analog Board / Charge Board / Battery Board / Connection Board
	Battery Module	
Ultrasonic Probe Module	Ultrasonic Probe	
	Probe Cable	
DC Adapter		

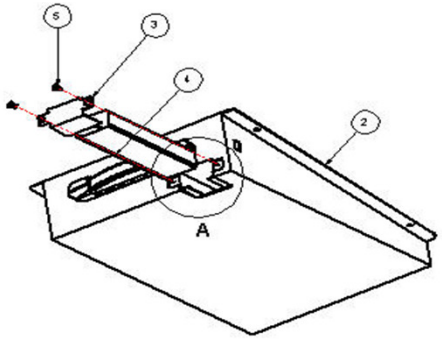
*Ref.: Service Manual (3.Structure and Assembling of the Device)

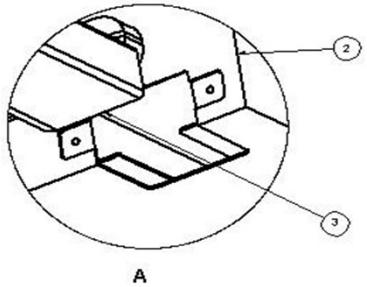
2. System Configuration

Console



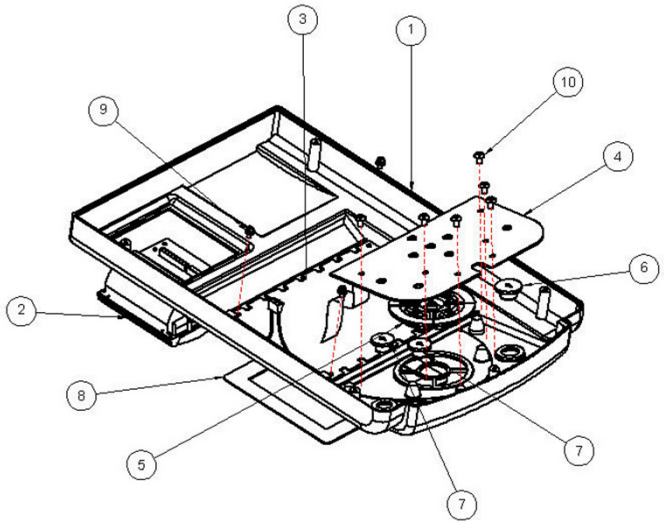


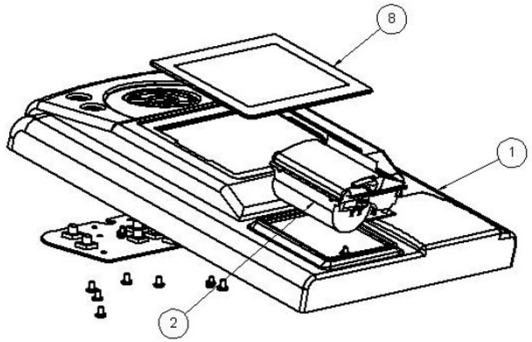




2. System Configuration

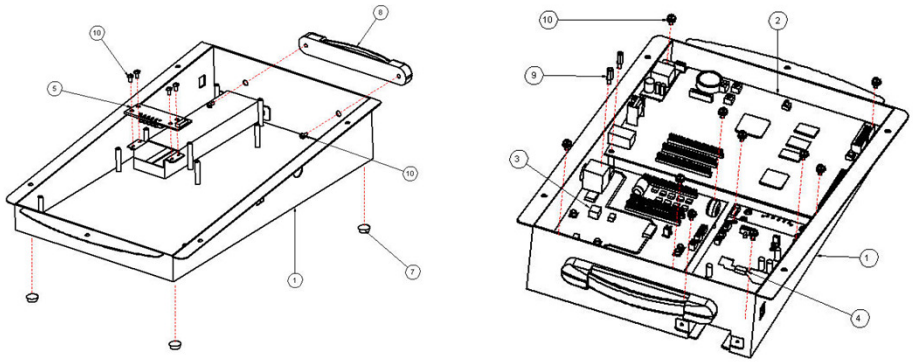
Upper Case

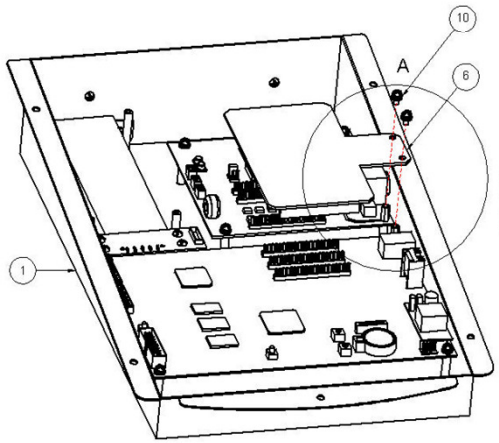


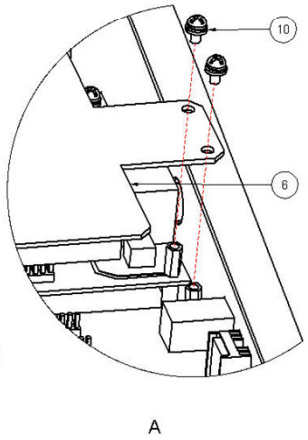


2. System Configuration

Lower Case

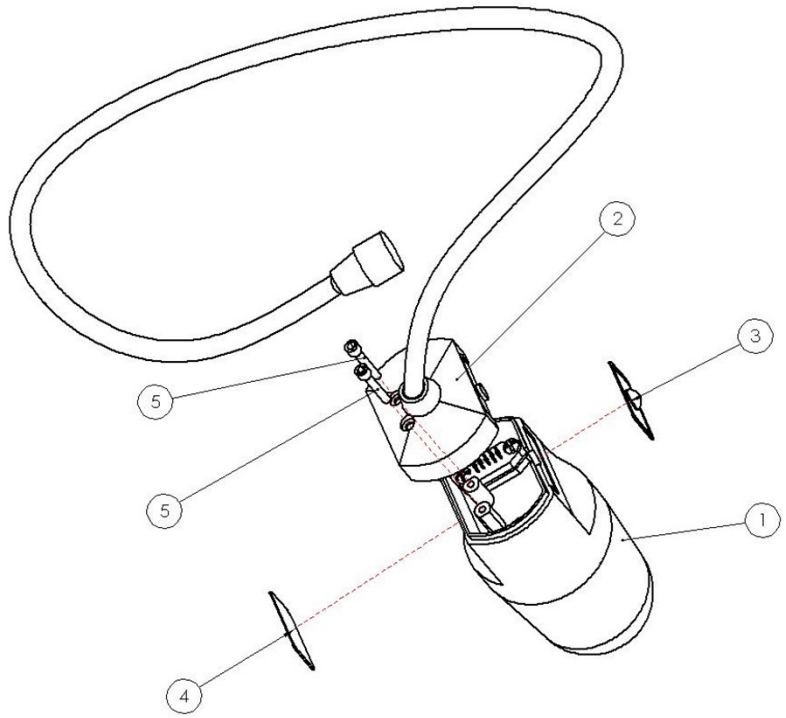






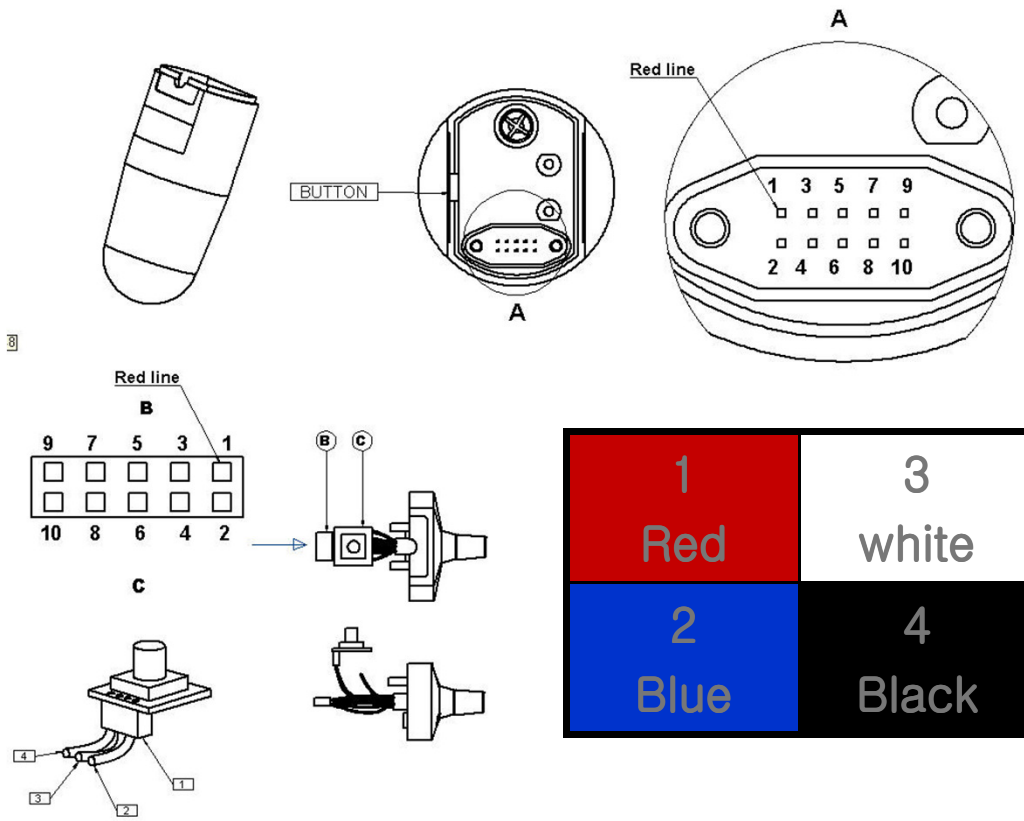
2. System Configuration

Ultrasonic Probe Module(1)



2. System Configuration

Ultrasonic Probe Module(2)



1 Red	3 white	5 Coaxial−	7 Pink	9 Brown
2 Blue	4 Black	6 Coaxial+	8 Yellow	10 Green

3. System Setup

- Firmware Upgrade
- Set the Maintenance Menu
- Set the Setup Menu
- Calibration

3. System Setup

Firmware Upgrade

Step	Activity
1	Install “**CS_Maintenance**” to a PC.
2	Execute “**CS_Maintenance**”.
3	Connect the device to the PC by using a USB cable.
4	Turn on the device.
5	Click “**Setup**” in menu bar, and then click “**Program Upgrade**”.
6	Click “**Select File…**” button in the Dialog box.
7	Choose firmware file to be upgraded.
8	Click “**Upgrade**” button in the Dialog box. (Must not be disconnected during upgrade.)
9	Remove the USB cable and Change to user mode after upgrade and booting of the device is completed.

The scan data stored is deleted when the Firmware is performed

3. System Setup

Maintenance Menu

Item	Available Value	Reset Value
Cal. Value	5~20	10
Store Mode	Current / Maximum	Maximum
System Reset	Return / Reset (The scan data stored is deleted)	Return
Probe Offset	4 ~ 20	9
Print Density	3 ~ 10	7
Outline Mode	On/Off	On

3. System Setup

Setup Menu

Item	Available Value	Reset Value
Clinic Name	–	–
Set Date / Time	–	–
Print Option	**Value Only / Raw Image / Walls / All Planes**	Raw Image
Flash Store	On/Off	On
Setup Print	–	–
Scan Result	Contour / B-Mode	B-Mode
Auto Power	Off, 3, 5, 7, 10 minutes	5 minutes
Calibration	–	–
Prescan Enable	On/Off	On

3. System Setup

Calibration

1. Check the error in the ultrasound transducer.
2. Verify the start position of the plane motor.
3. Verify the direction of rotation of the plane motor.
4. Check the plane motor rotation.
5. Set the angle motor offset.
6. Check the angle motor rotation.
7. Set the reference threshold.

3. System Setup

Required material

- BioCon-500 Unit (Including Probe)
- Calibration Kit
- Saline Solution: About 2.5 liter

3. System Setup

When we should perform calibration?

Item	When	Remark
1	When you upgraded BioCon-500's program over Version 3.10	Necessary
2	After replacing Analog Board	Necessary
3	After replacing Digital Board	Necessary
4	After replacing Probe	Necessary
5	Periodical check (Once a year)	Recommended

3. System Setup

Preparing the CalKit.

Step	Figure	Description
1		Open the cap of the CalKit and pour saline solution up to the fill-mark of the CalKit. Confirm that the air bubble is absent.

3. System Setup

Preparing the CalKit.

Step	Figure	Description
2		Close the cap of the CalKit.

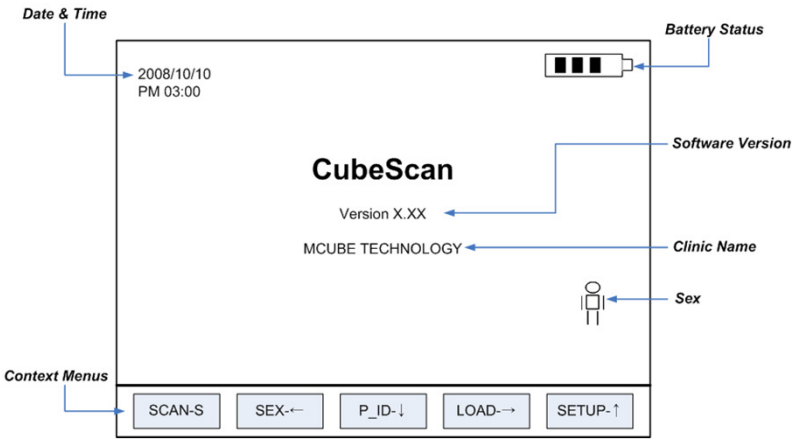
3. System Setup

Preparing the CalKit.

Step	Figure	Description
3		Align the probe scan button with the arrow mark of the Calkit, and put the probe into the probe holder firmly.

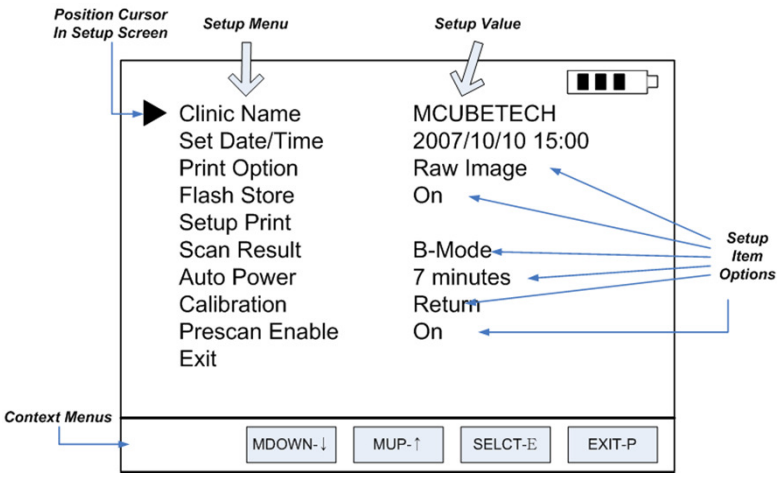
3. System Setup

Processing calibration

Step	Screen Display	Description
1		The Top Screen. Connect probe and then turn on the BioCon-500. Press UP key to go to setup menu.

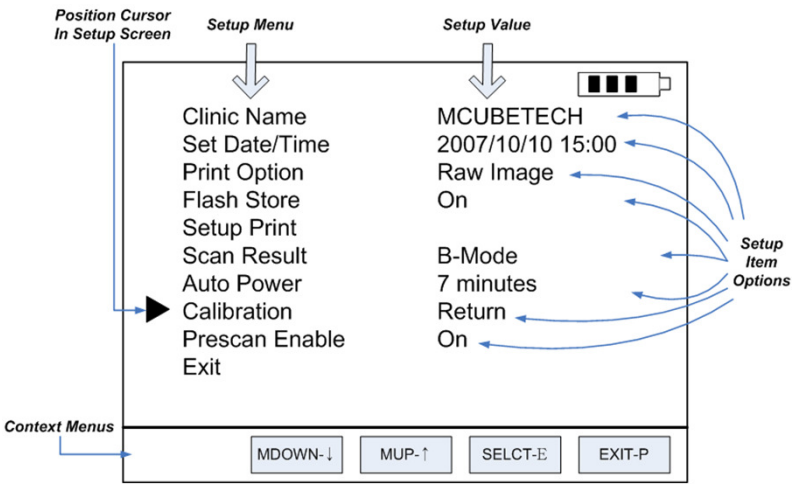
3. System Setup

Processing calibration

Step	Screen Display	Description
2		Setup Menu Go to “Calibration” setup using UP or DOWN key.

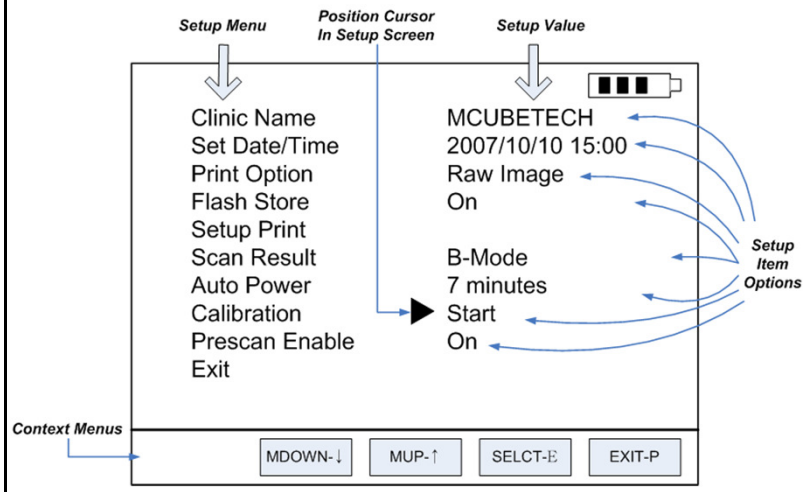
3. System Setup

Processing calibration

Step	Screen Display	Description
3		Press ENTER key.

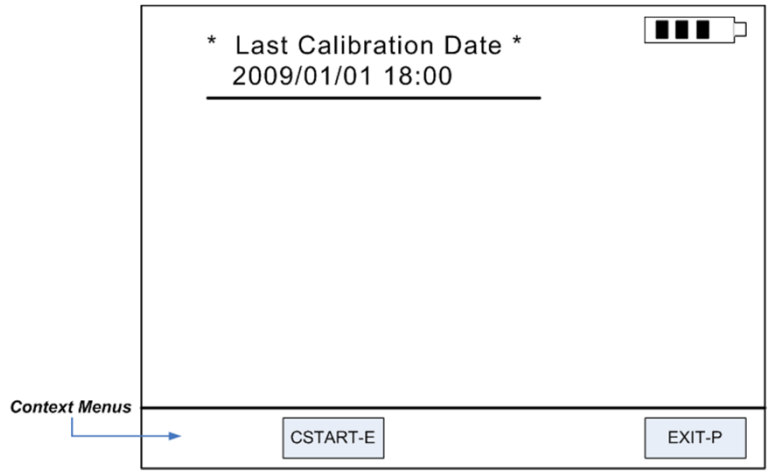
3. System Setup

Processing calibration

Step	Screen Display	Description
4		Display the “Start” setup value using LEFT key or RIGHT key

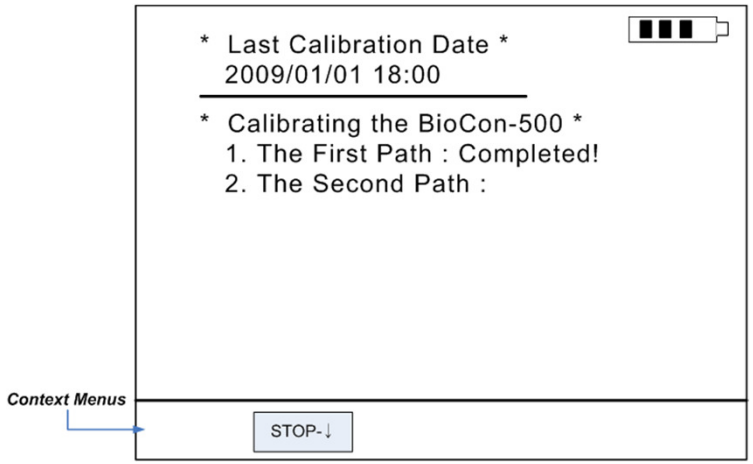
3. System Setup

Processing calibration

Step	Screen Display	Description
5		Calibration top screen To start calibration, press ENTER key.

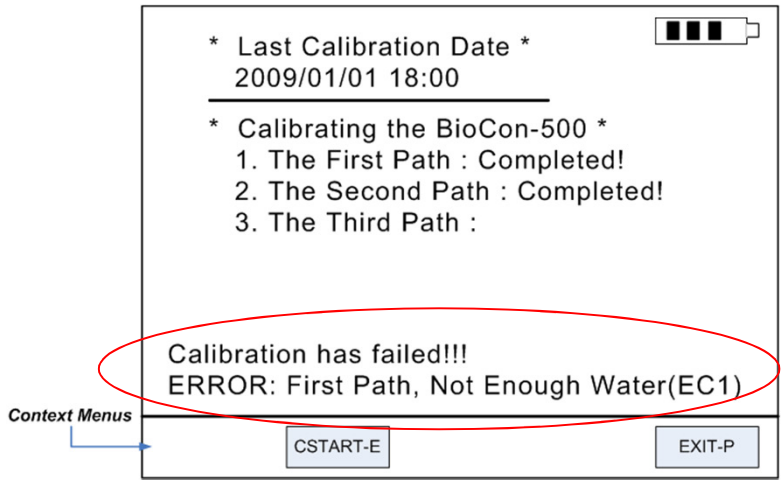
3. System Setup

Processing calibration

Step	Screen Display	Description
6		Screen during calibration. To stop calibration, press DOWN key in the first path or second path. In the third path and fourth path, a user cannot stop the calibration

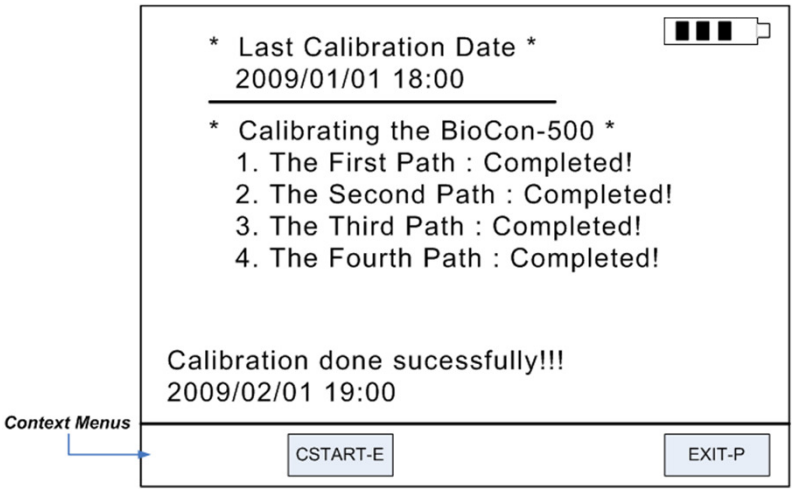
3. System Setup

Processing calibration

Step	Screen Display	Description
7		When there is any error during calibration, the system displays the following message in the bottom part of the LCD screen. *Common points to be checked in case of calibration error. 1) Check the water level. 2) Check the position of a plastic jig in the CalKit. 3) Is there any air bubble in the water? 4) The cover position of the CalKit is OK. 5) The probe position in the probe

3. System Setup

Processing calibration

Step	Screen Display	Description
8		The screen when the calibration is done successfully. The date and time when the calibration is done successfully is displayed in the bottom part of the LCD screen.

3. System Setup

Calibration Error Code

Error Code	Description	Remark
1	Insufficiency of saline solution	Check the water level.
2	Transducer error	Check the transducer Check probe connection
3	Variation in the plane motor start position	Check the plane motor Check probe connection
4	Error in the direction of the plane motor rotation	Check the plane motor Check probe connection
5	Reserved	
6	Reserved	

3. System Setup

Calibration Error Code

Error Code	Description	Remark
7	Error in the Analog Board	Check the Analog Board
8	If there's no reflection signal from target.	Probe is not in the CalKit.
9	Error in the direction of the angle motor rotation	Check the angle motor Check probe connection
10	Variation in the angle motor start position	Check the angle motor Check probe connection

3. System Setup

Calibration Error Code

Error Code	Description	Remark
11	Distance error from transducer to target	Frame breakaway
12	Too low echo signal	Confirm that the air bubble is absent. Check the Analog Board
13	Too high echo signal	Confirm that the air bubble is absent. Check the Analog Board
14	Reserved	

3. System Setup

Calibration Error Code

Error Code	Description	Remark
15	Measured volume value is different reference value.	(Phantom calibration)
16	Scan data transmission error	Check the Control Board Check the Analog Board (Phantom calibration)
17	Big difference between two end detection algorithms.	(Phantom calibration)
18	Reserved	

4. Module Test

- Analog Board
- Ultrasonic Probe
- Control Board

4. Module Test

Analog Board

Item	Location	Value
Power	TP1(GND) & '+' of L9	+5V (+/- 5%)
Power	TP1(GND) & '-' of L3	-4.8V (+/- 5%)
Power	TP1(GND) & TP8	+7.7V (+/- 5%)
TCG1 Rising Time	TP1(GND) & TP10	5.5 ~ 7.2[us]
TCG2 Rising Time	TP1(GND) & TP11	156 ~ 172 [us]
Ultrasonic Pulse Peak to Peak	TP1(GND) & TP6	60 ~ 90 [Vpp]

4. Module Test

Ultrasonic Probe

Probe Cable Pin No.	Measured Value
Pin 5 & 8	15(+/−)1 (ohm)
Pin 10 & 11	
Pin 13 & 15	
Pin 16 & 17	
Pin 1 & 6	Short (normal) /Open (abnormal)
Pin 1 & 3	Open (button off) / Short (button on)

4. Module Test

Control Board

Check point	
Check operation of the LCD.	
Check operation of the Printer.	
Check operation of the Key Board.	
Check operation of the Ultrasonic Probe.	
Check operation of the USB.	

5. Troubleshooting

System is not turned on

No.	Check point	Description
1	Is POWER key pressed for more than 1 second?	The system operates when pressing the POWER key for more than 1 second.
2	Voltage of battery module.	Above +7V
3	Is battery module connected?	If not, connect the module.
4	Connector between the Key Board and the Control board ?	Connect the connector between two boards.
5	Is connected from the Battery Module to the Control Board in the right direction?	Control Board – Analog Board Analog Board – Charge Board Charge Board – Battery Board
6	Not solved yet?	Exchange control boards.

5. Troubleshooting

System is not turned off

No.	Check point	Description
1	Is POWER key pressed more than 1 second?	The system operates when pressing POWER key for more than 1 second.
2	Is the system not turned off even when pressing the Power key for more than 1 second?	Turn the power off by removing the battery module from the system. And exchange control boards.

5. Troubleshooting

System turn off while in use

No.	Check point	Description
1	Is auto power-off on in the setup menu?	When auto power-off function is active, system will be turned off if no key input is made during the fixed time.
2	Is the system turned off with the message of “BATTERY LOW, SYSTEM WILL BE TURNED OFF”?	Turn off the system to protect the battery module if the power is insufficient. Try again after charging.

5. Troubleshooting

Initial screen is not display after turn-on

No.	Check point	Description
1	Is backlight on in LCD?	Check if the connector for backlight of LCD is connected.
2	Is the FPC connector to the LCD module well connected?	Check if the connector is connected properly.
3	Check the voltage between the Control board ground and 12th pin of JP5.	Check if -23V (+/-1V).
4	Check the voltage between the Control board ground and 13th pin of JP5.	Check if -18V (+/-1V).
5	Is the system turned off?	Retry after replacing the LCD module.
6	The system is not turned off.	Test again after replacing the Control board.

5. Troubleshooting

Green LED is not turned on with adapter being connected

No.	Check point	Description
1	Is green LED not turned on even when the system is OFF?	Yes ->Refer to item 2. No -> Refer to item 4
2	Is the 4 pin connector connecting the Key Board and the Charge Board connected?	Check the connection status and if not connected, connect 4 pin connector.
3	Not solved yet?	Replace the Charge Board.
4	Green LED is on when the system is OFF, but it is turned off when the system is ON.	No problem. Because of charging control in Control board sometime Green LED is off when system is on.

5. Troubleshooting

NO SCANHEAD Error Message

No.	Check point	Description
1	Is the ultrasonic probe connected to the main body?	If not, NO SCANHEAD message is displayed when the scan button is pushed.
2	Is open between the the 1st and 6th pin of the probe connector?	Test again after replacing with other ultrasonic probe.
3	The message is displayed when the 1st and 6th pin of Probe connector is short	Request service from the headquarter

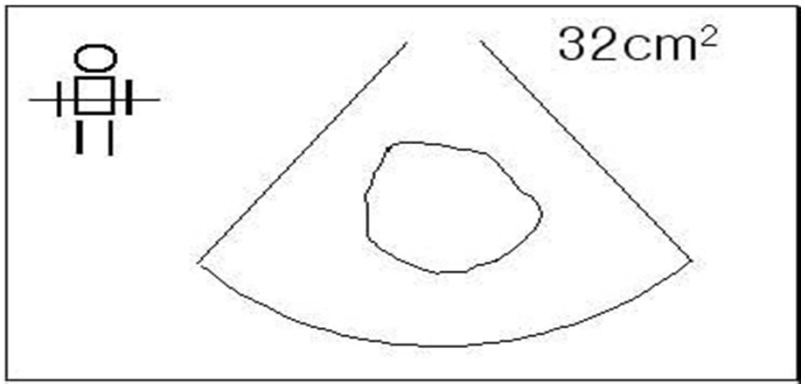
5. Troubleshooting

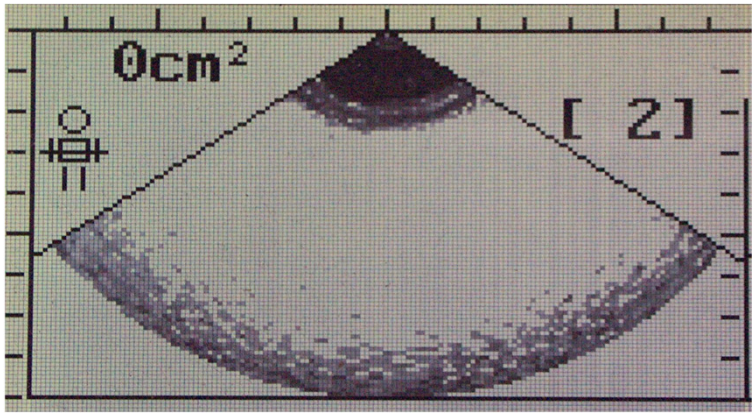
NO PAPER Error Message

No.	Check point	Description
1	Does printer module have thermal paper?	If not, insert thermal paper.
2	Does message still appears even when there is paper?	Try again after replacing the control board.

5. Troubleshooting

Image after SCAN(1)

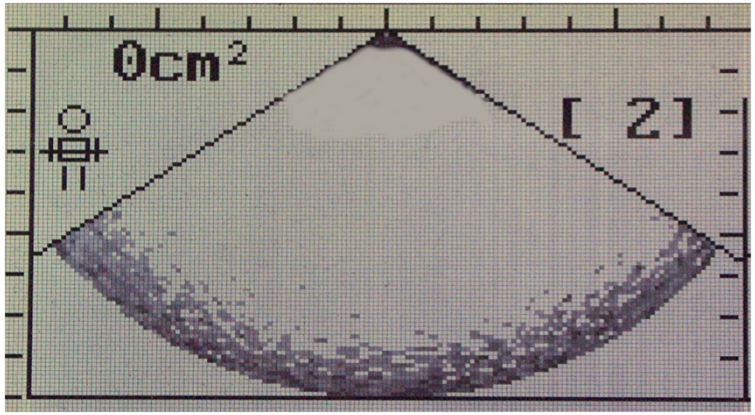




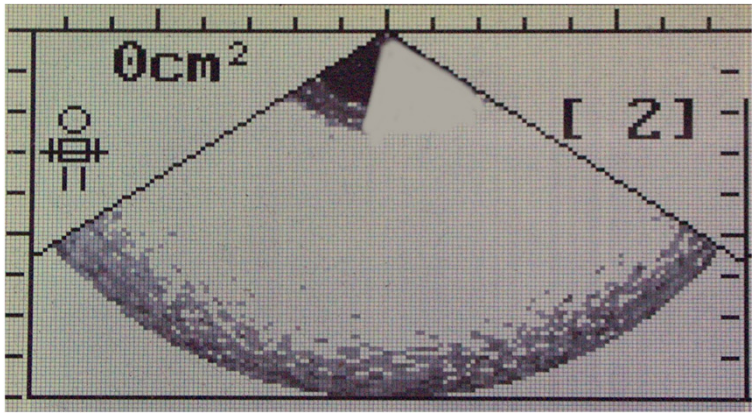
- Image showing the scan result is set as CONTOUR
- Normal Image
- Scanned image from open object (in air).

5. Troubleshooting

Image after SCAN(2)



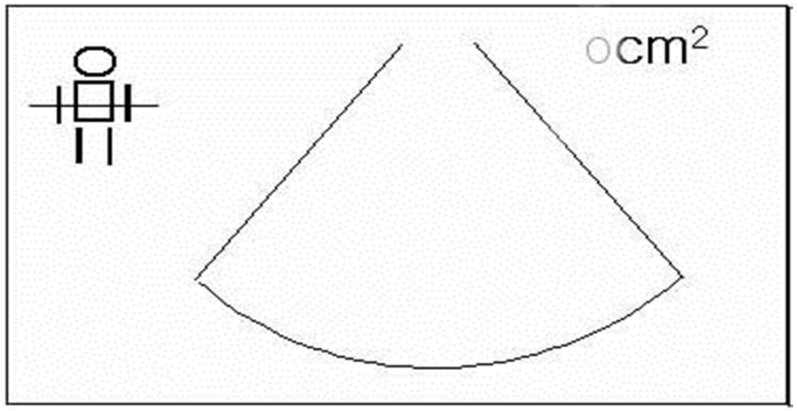
- Image ,when the transducer connection is open.
- Check using the Calibration Kit.



- Error in transducer connection.
- Retry after replacing the probe

5. Troubleshooting

Image after SCAN(3)



- Check if 'SCAN RESULT' is set as 'CONTOUR'.
- Yes, retry after setting as 'B-MODE'.
- No, request service from the headquarter.

5. Troubleshooting

Error in Motor Rotation

No.	Check point	Description
1	Check error in motor. Measure the resistance of each case in probe Connector 1) Pin number 5 and 8 2) Pin number 10 and 11 3) Pin number 13 and 15 4) Pin number 16 and 17	Normal resistance value 15 +/- 1 (Ohms)
2	In case of normal resistance.	Retry after replacing analog board.

5. Troubleshooting

Printing Error (No feeding)

No.	Check point	Description
1	Thermal Paper	No paper. Properly insert.
2	Motor sound?	Yes, goto 3 No, check the printer connector
3	Not solved?	Replace control board.
**Paper Spec. : 57mm(width), ø30mm*		

5. Troubleshooting

Battery Management

1) After full charging (for battery module with full capacity)
   scan : 4 hours(one scan per 15sec)
   standby : 6 hours

2) Full charging Time : about 10 hours (MAX)

3) Battery Module is supply (with 6 months warranty)

Discussions

Any Questions???

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